tion of ϕ' has almost entirely to be considered in 2. It is this which constitutes the chief difference between the sliding and the fixed seat, and which accounts for the sense of fatigue experienced in the legs in the former system.

If we examine the problems which arise from the consideration of Fig. 1 we shall find that in using the term "fixed seat" we are speaking incorrectly; that is to say, as far as there exists a force to hold A in position we have none but friction; and that practically the position of A with regard to L is determined by muscular action.

Thus in Fig. 2 the seat is really more fixed than in Fig. 1, or there is less muscular action round T' than round T.

The advantages of the system 2 over 1 are however not simply mechanical, but the constancy of the angle α' affords greater space for the respiratory movements, and thus physiologically there is an explanation for the difference in disturbance of circulation and respiration generally experienced when comparing the two systems.

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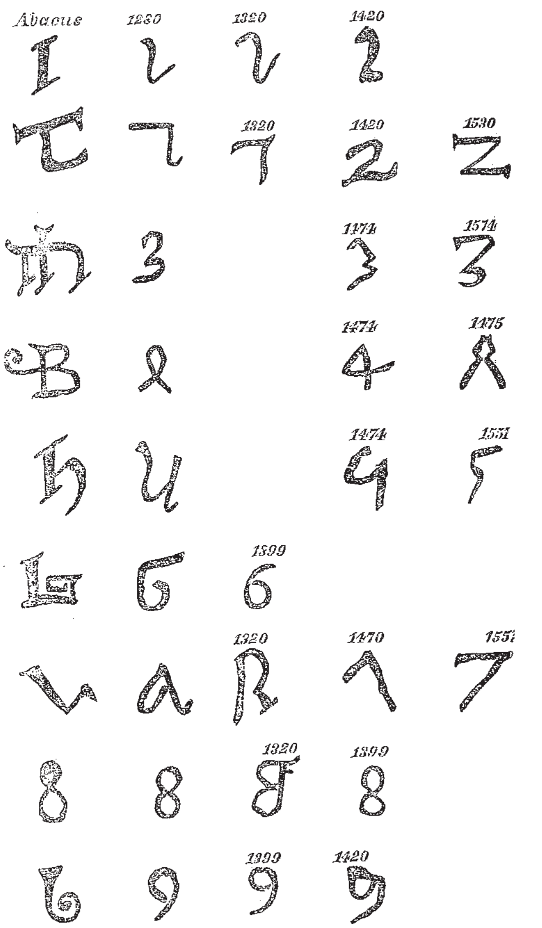
History of the Numerals

ON reading the letter on the "Origin of the Numerals" (vol. xii. p. 476) I was reminded of some portions of their history which I had before noted down, and which are essential to any consideration of their origin.

The earliest forms which I have seen are those of the Abacus (Jour. Archæol. Assoc., vol. ii.), from which our later forms are mainly, if not entirely, derived. The intermediate forms are to be seen in arithmetical treatises and calendars of the thirteenth to sixteenth century, and on sundry quadrants, &c., of the fourteenth to sixteenth century, in the British Museum.

In the following table the earliest form of each letter and of



each variation is entered, with the corresponding date; the years 1280, 1320, 1420, and 1450 are only approximately stated.

Now, with respect to the primitive forms suggested by Mr. Donnisthorpe, the 2 would seem to have been two strokes at right angles (not parallel), the lower stroke of our form being only a *tail*, like that of many *medial* forms of Hebrew letters. The 3 may have been originally three vertical strokes, which were set horizontal in early times; the flat top, however, does not appear till 1574, and then only in English examples apparently. The 4 of the Abacus seems to have been deserted for cross lines connected, which are always placed diagonal till about 1474, when the first turn to the present position occurs: perhaps four strokes were intended, as we call cross-roads "four roads meet." 5 seems to have been inverted from the Abacus, and then about 1550 the straight tail was curved towards the previous figure, and the head elongated to lead to the next mark. It often occurs as a perfect though very straightened S in the sixteenth century, as it is now made in Belgium and other countries. Its form in 1280 reminds one of the Roman V written as U. 6 in the Abacus consists of six strokes; but this, from their cumbrous collocation, is probably merely a scribe's fancy. 7 has been apparently inverted (like 5) from the Abacus; its transitions are easily traced, but its origin is not so clear; some might see a trace in the Greek Z = 7. 8 has always been very near its present form, and the two squares is an explanation the character of which can only be objected to on the grounds of its inapplicability elsewhere. 9 has always had a straight tail, though it has been inverted since the Abacus form (as 5 and 7 seem changed): its origin might be looked for in the Greek θ possibly, as that letter has varied more in form than any other; or, more likely, in the Arabic Ta, or Tha (= 9), which in the Abacus it closely resembles; and it is even more similar to the Syriac Teth, a twin form to that of the Arabic. Perhaps the ancient Arabic alphabet (in its nearer approximation to its Hebrew- and Samaritan-like original) would show the origin of more of these forms, and even the simple 1 is exactly the Arabic *Elif* = 1, for their alphabetic origin is rendered highly probable from the fact that the numerical systems of the Greeks and of the Semitic nations (from whom our *Arabic* numerals probably came) were in very early times derived from the alphabet; not, like the Egyptian and Roman systems, wholly separate arrangements.

The apparent, though historically untrue, applicability of the line + line origin of all the forms of our numerals, is an interesting example of the fallibility of any theory which only looks to present conditions, apart from past facts and history.

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W. M. FLINDERS PETRIE

Scarcity of Birds

I QUITE agree with Mr. Barrington, who writes in NATURE (vol. xii. p. 213) concerning the scarcity of birds. I find, by comparing my last year's ornithological diary with the present year's one, that I have only found about three-fourths of the number of Blackbirds' (*Turdus merula*), Thrushes' (*Turdus musicus*), Blue Titmouses' (*Parus cæruleus*), Pied Wagtails' (*Motacilla alba*), Greenfinches' (*Coccothraustes cloris*), Linnets' (*Linota cannabina*) nests that I found last year. The Hirundinidæ have been far less plentiful than usual; but the Goldfinch (*Carduelis elegans*) was the rarest bird here this summer. I did not succeed in finding a single nest, although our yearly average is fifteen. Other birds, as the Charadriidæ and the Mussel Thrush (*Turdus viscivorus*), have been very plentiful, and I found the Mountain Linnet's (*Linota montium*) nest for the first time I have ever met with it on the lowland south of the Humber. Will not the hard frost of last winter account for the scarcity of our native birds in some measure?

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OUR ASTRONOMICAL COLUMN

μ CASSIOPEÆ AND VICINITY.—Smyth (Cycle ii. p. 25) has the following remark with respect to stars near μ Cassiopeæ:—"Just 18′ south of μ is a star which, though of the 6th magnitude, is not in Piazzi. It is followed nearly on the parallel, about 11^s off, by a 9th magnitude, and both are remarkable from being red, of a decided but not deep tint." There is no star of the 6th magnitude near this position at the present time, nor so far as we know is there any record of such an object having been visible since the epoch of Smyth's observations, 1832·71.

It may, however, prove to be a variable star of long period, like the 8th magnitude orange-coloured star remarked by the same observer near Procyon in the autumn of 1833, the existence of which is supported by the observation of Mr. Isaac Fletcher, as described in Smyth's *Sidereal Chromatics* and elsewhere, and we believe by the experience of the Rev. T. W. Webb. There is now a star of the 9th magnitude, following μ Cassiopeæ, 17s·2 and 15′ 38″ south; this is clearly Argelander's star + 53°, No. 228 of the "Durchmusterung," there estimated 9·5, a considerably fainter object than an average 9th magnitude in Bessel's scale; its place would appear to correspond better with that of Smyth's star following his 6th magnitude, nearly on the parallel, than with that of the missing one. Probably this small star may be variable also; its place for the beginning of the present year is R.A. 0h. 59m. 58·3s.; N.P.D., 35° 41′ 27″.

Smyth thought his 6th magnitude star, omitted by Piazzi, might have had "something to do with the mistakes of Flamsteed respecting μ, alluded to by Mr. Baily." These mistakes seem rather to have originated in the confusion of the stars θ and μ, and although Baily doubted if the place of the latter, which he gives from Halley's edition of 1712, could be depended upon, it will be found to agree very well with that of μ carried back from the position in the Greenwich Catalogue of 1860, with Mädler's proper motions.

Should any reader of this column have had the curiosity to look for Smyth's reddish stars, perhaps he will communicate the result of his examination of their neighbourhood.

THE DOUBLE STAR Σ 2120.—Mr. J. M. Wilson has favoured us with the following measures of this star, made at the Temple Observatory, Rugby, by himself and assistants :—

1872·48	Pos.	262°·9	Obs.	4	Dist.	3″·78	Obs.	2
73·50	,,	261°·7	,,	6	,,	3″·65	,,	2
74·62	,,	258°·5	,,	4	,,	4″·2	,,	2

Comparing these measures with the formulæ for rectilinear motion already given in NATURE, the following differences are shown :—

1872·48	Pos. $(c-o)$	− 0°·4	Dist. $(c-o)$	+ 0″·65
73·50	,,	− 0°·3	,,	+ 0″·91
74·62	,,	+ 1°·8	,,	+ 0″·51

Mr. Wilson has had a suspicion of variation in the magnitude of the companion, but thinks this may be owing to atmospheric circumstances.

THE MINOR PLANETS.—It is notified from Berlin, in M. Leverrier's *Bulletin International*, that the small planet detected by M. Perrotin at the Observatory of Toulouse, on the evening of Sept. 21, in R.A. 23h. 16m. 8s. and N.P.D. 95° 12′, is a new one, and will therefore be No. 149. The brighter members of this group now near opposition are Bellona, Clotho, and Thyra. Clotho will be between the 8th and 9th magnitude; the calculated places are, for Greenwich midnight, as follows :—

			h. m. s.			° ′
Oct. 23	...	R.A.	3 34 47	...	N.P.D.	90 36·0
,, 27	...	,,	3 32 50	...	,,	91 17·0
,, 31	...	,,	3 30 30	...	,,	91 55·8
Nov. 4	...	,,	3 27 51	...	,,	92 31·6
,, 8	...	,,	3 25 0	...	,,	93 3·4

TRANSIT OF COMET 1826 (V.) OVER THE SUN'S DISC.—It was remarked by Gambart that the comet discovered by Pons on the 22nd of October, 1826, the "comet in Bootes," as it was called at the time, must pass over the sun's disc on the morning of November 18, and he was at some pains in correcting the elements of the orbit, with the view of deciding whether the comet had left the disc, before it was examined by himself and Flaugergues, the only two observers who were at stations partially free from cloud on the morning of the transit. A letter from Gambart addressed to Sir John Herschel, at that time president of the Royal Astronomical Society, conveying an intimation of the expected phenomenon, arrived in London on the evening previous to the transit, and, as stated in vol. iii. of the Memoirs of the Society, "the news of so rare a phenomenon was immediately spread, and few astronomers in or near the metropolis failed to be prepared for it;" the sun, however, was totally obscured at rising, and for the whole day, by clouds and rain. A dense fog appears to have prevailed very generally over the continent of Europe, so that, as mentioned above, Gambart at Marseilles and Flaugergues at Viviers alone obtained a view of the disc during the interval in which it was expected the transit would take place.

The following particulars of the transit founded upon a new calculation from the corrected elements of Gambart, closely representing the observations between Oct. 26 and Dec. 11, may possess interest for the astronomical reader.

The comet's true geocentric positions, for Greenwich mean time, were :—

			R.A.		N.P.D.
			° ′ ″		° ′ ″
Nov. 17.	17h.	...	233 7 5	...	108 51 48
,,	19h.	...	233 7 52	...	109 11 50
,,	21h.	...	233 8 38	...	109 31 26

Whence, correcting for aberration and taking the sun's places from Carlini's tables, the following differences of R.A. and N.P.D. of comet and sun's centre result :—

	h.		′ ″		′ ″
Nov. 17.	17	Diff. R.A.	+ 5 31	Diff. N.P.D.	− 16 48
,,	18	,,	+ 3 19	,,	− 7 19
,,	19	,,	+ 1 7	,,	+ 2 2
,,	20	,,	− 1 6	,,	+ 11 17
,,	21	,,	− 3 19	,,	+ 20 26

And as referred to the centre of the earth, we find :—

		h. m.	
Ingress	Nov. 17 at	16 59·9	at 19° from sun's N. point towards E.
Egress	,,	20 22·5	at 184° ,, ,, ,,

At Marseilles, the egress would take place at 20h. 59m. apparent time, the equation of time being 14m. 43s. additive to mean time.

As is well known, neither Gambart nor Flaugergues were successful in detecting this comet upon the sun's disc, but though visible at one time to the naked eye, it was not of any considerable degree of brightness.

FAYE ON THE LAWS OF STORMS*

Mechanical Theory of Whirling Movements.—Before we enter on the mechanics of these phenomena, it is necessary to clear the way by the removal of certain ideas which constantly recur to the mind of the reader, and by distracting his attention render any clear unbiassed perception of the subject altogether impossible. This preliminary discussion will embrace the three following points: the part played by electricity in the formation of whirlwinds and cyclones, the significance to be attached to the indications of the barometer, and the part played by currents of aspiration in the modern theory of the trade winds.

1. Part played by Electricity.—Certain physicists, dissatisfied with the views we are about to refute, and struck with the electrical phenomena which so often accompany hurricanes, typhoons, &c., have supposed that electricity is the determining cause. We shall perhaps give a clear idea of this theory by reverting to the electrical explanation of hail, the phenomena of hail being intimately bound up with that of whirling movements. It is well known that hailstones are composed of layers of ice alternately opaque and transparent; in breaking them we see in their texture the evidence of successive and alternate

* Continued from p. 501.